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研究ノート

A SURVEY OF TELECOMMUNICATIONS USE IN PRESERVICE TEACHER EDUCATION PROGRAMS

Douglass J. Scott

This paper reviews studies related to computer-mediated communications (CMC) use in preservice teacher education programs. A total of 18 studies were examined which span a variety of media, techniques, and evaluation. However, an analysis of these studies reveals little or no commonly accepted central core of work, methods, or theories to guide future research. Although this paper focuses on preservice teacher programs, it has broader application to the creation, operation, and evaluation of any type of educational telecommunications project.

Key words
computer-mediated communication, educational telecommunications, preservice teacher education

1. Introduction

This paper focuses on telecommunications use in preservice teacher education programs, including an analysis of how these programs are being evaluated by educational researchers. It explores different ways of thinking about on-going research to better understand the state of the field, find common elements that can inform new telecommunications projects, and find gaps in the literature in which to situate future research.

Levin (1995) contends that despite increasing use of educational telecommunications, "an overall conceptual framework is largely lacking to guide such uses. Such an overall framework would be useful in helping network participants understand how a particular activity fits into the larger scheme of things, and would also help them generate newer, more powerful learning activities." I examined the existing body of relevant literature to inform my study of telecommunications use in a preservice teacher program. The results of that study are in preparation.

The guiding questions for this paper are:

- What is the nature of telecommunication use in preservice teacher education?
- Which technologies are being explored?
- What objectives are being sought?
- What research methods are being employed to examine and assess this use?
- And, which technologies and research methods might researchers pursue in the future?

The following sections address each of the

Michigan State University

above questions in order.

2. Method

A total of 18 journal articles and conference presentations were selected that focus on the use of telecommunications in preservice teacher education programs. Some of these papers were published in traditional journals and conference proceedings, while others were posted on the World Wide Web; URLs (Uniform Resource Locator) for on-line articles are included in the bibliography. These studies vary greatly in their scope of inquiry and the depth of their analysis as will become apparent in the following discussion. The limited number of available studies and the emerging nature of this field compel me to address each study in greater depth than may be common. It is hoped that this additional depth will provide the reader with a greater understanding of the variety of approaches and methods being used.

3. Overview of the Studies

The 18 studies reviewed in this section include teacher education programs located in America, Australia, and an unidentified European country. The overwhelming majority of these studies focused on undergraduate teacher certification programs (15), while three studies looked at graduate-level programs (i.e. Roddy, 1996; Veen, Lockhorst, & Korthagen, 1995; and McDevitt, 1996).

While some of these studies appear in traditional print journals, others were conference presentations posted on the World Wide Web, and still others were contributions to electronic (on-line) journals. The number of articles appearing in non-traditional formats speaks to the relatively recent interest in this area of research and the exploration of using Internet-based resources for disseminating research and facilitating scholarly discourse (Burbules & Bruce, 1995; Frohna, Martin, & Scott, 1996).

4. Media Used

Based on a reading of these studies, electronic mail (e-mail) is the media of choice in preservice education programs. A total of 14 of the 18 studies under review used e-mail, sometimes in combination with another communication media, although a majority of these programs (10) relied solely on e-mail communications.

Two types of e-mail communications can be distinguished: One-to-one communications ("regular" e-mail) and one-to-many communications (electronic discussion list or "listserv"). Some researchers consider e-mail and listservs as two distinct types of communications rather than combining them under the general category of "e-mail communications." However, the studies under review use these terms more loosely, and one must read them carefully to determine the exact nature of the communications being employed.

Listservs, in this context, are distinguished from bulletin board systems (BBSs) or conferences, which are discussed below. Listservs generally take a single e-mail message and "explode" (automatically send) a copy to all members subscribed to that list. Although all messages sent to the list are often archived on the mail server, access to this archive is often difficult; the access commands can be arcane, and, based on my experience with secondary school telecommunication exercises, this feature is sel-

dom used. In contrast, conferences store messages which are posted to a particular topic, adding responses to this item immediately below it in an accessible, and, depending on the interface, visual manner

An equal number of studies (seven) used e-mail based listservs (e.g. Campbell & Zhao, 1996; Thirunarayanan, 1996; Dow & Geer, 1996), and direct (one-to-one) e-mail (e.g. Souviney, Saferstein, & Chambers, 1995; Thomas, Clift, & Sugimoto, 1996). Two projects relied on both listservs and direct e-mail messages (i.e. Nason, 1996; Veen et al., 1995).

It has been observed that computer-mediated communications (CMC) are often mistakenly thought of as being synonymous with electronic mail (Metz, 1994). Despite the widespread use of e-mail, the CMC in teacher education literature shows that a variety of communication methods are being also used including conferences, two-way video, and facsimiles. Several researchers used computer conferences, both alone (Harrington, 1992; Harrington & Hathaway, 1994), and in combination with e-mail (Stahlhut & Hawkes, 1994; Clarken, 1993). Three programs used video hook-ups, sometimes alone (Rezabek, Cochenour, & Hakes, 1996), sometimes in combination with e-mail (Allen, 1995), and other times with face-to-face discussions (McDevitt, 1996). Durham and Sunal (1991) also experimented with facsimile machines in combination with e-mail and computer conferences.

One of the distinguishing characteristics of the studies under review is who was admitted to the electronic discussion. Membership is important as it can shape the nature of the discussions by narrowing or broadening the scope of topics addressed by the participants and establishing a sense of security which may influence users' sense of safety to broach sensitive subjects. Two main types of list members were 1) programs whose e-mail, or discussion list, messages were confined to preservice teachers and program faculty (e.g. Harrington & Hathaway, 1994), and 2) those whose lists included people outside of the program, for example cooperating teachers (Stahlhut & Hawkes, 1994), program alumni (Roddy, 1996), or other non-teaching practitioners (Nason, 1996). Nearly half of the studies reviewed mentioned problems associated with the technologies being used: Lack of knowledge of the media, lack of access to computers, and limited time to participate in the discussions. While this finding may not be surprising, helping future teachers overcome these difficulties, especially those resulting from a fear of technology, is essential to enable them to make use of similar technologies in their own practice. However, few, if any, of the studies provided an in-depth analysis of these limiting factors, and thus little advice is provided about how to mitigate their effects. Additionally, little information is available about those interns who rarely participated, lurkers and non- participants, but such an examination could reveal interesting and potentially useful insights for those educators trying to incorporate telecommunications into their curriculum.

The variety of communication media used in these studies indicates a healthy and vigorous exploration of how emerging technologies can facilitate different learning outcomes. Electronic mail, and listservs in particular, dominate these studies, but this may be due to their current accessibility. As other technologies become more available, the current studies should provide some assistance to teacher educators seeking alternative modes of communica-

tion for their programs.

5. Research Objectives

Current research reveals a range of goals for using telecommunications in preservice teacher education. These goals include 1) promoting reflection among preservice teachers, 2) overcoming the barriers of time and distance to communicate with interns in the field, and 3) promoting mentoring (both between interns and by the program faculty). These goals were, to varying degrees, achieved in most studies. These research objectives can be organized into five main areas of emphasis:

1. Enhanced within program communication,
2. enhanced outside program communication,
3. CMC integrated into coursework,
4. critical thinking/critical reflection, and
5. miscellaneous objectives.

These objectives will be described first, followed by an analysis of their implications.

5.1 Enhanced Within Program Communication

The InternNet project used e-mail to explore alternative modes of communication between university faculty and preservice teachers (Souviney et al., 1994). This study was one of two which relied exclusively on regular e-mail for all communications. The authors focused on two types of social influences that shaped InternNet: Social activities related to implementing and learning how to use the technology, and the social activity of the mutual adaptation by the users and their application of the technology and the social conventions (organizational culture) of InternNet and the users' communication activities.

Researchers at the University of Illinois at Urbana-Champaign also relied exclusively on e-mail to investigate how university-based instructors and novice teachers can integrate electronic mail into teacher education (Thomas et al., 1996). Students in this program used e-mail to complete some class assignments and communicate with their peers and program faculty during two field placements.

Appalachian State University sought to overcome the isolation that often typifies teaching in general, and preservice teacher field placements in particular, by establishing e- mail and listserv communications for its students and faculty (Schlagal et al., 1996). Students were required to send at least two messages each week during their field placement. Different lists were created for separate topics in an attempt to compel students to consider the content of their message before posting it.

Graduate-level certification students at Seattle University used several discussion lists, organized into cohort and alumni groups, to communicate with one another, program faculty, and novice teachers who were program alumni (Roddy, 1996).

E-mail was used by a European graduate certification program whose interns participated in a listserv during their field placements (Veen et al., 1995). This study attempts to assess the value of this technology in promoting reflective skills.

The University of Northern Iowa used a combination of e-mail and computer conferences to create collaborative partnerships with nine major school districts within the state (Stahlhut & Hawkes, 1994). Most benefits from these technologies came through increased communi-

cation between program faculty and practicing teachers, although some preservice teacher-faculty communication benefits were observed.

A program at Northern Michigan University used regular e-mail and conferences to facilitate communication between its preservice teachers placed in rural areas across the Michigan's Upper Peninsula and in northern Wisconsin (Clarken, 1993). Students volunteered to participate in these discussions in lieu of attending three of five weekly seminar sessions.

A program conducted by the University of Alabama used regular e-mail and fax technologies to facilitate communication with its early childhood and elementary preservice teachers during their field placements (Durham & Sunal, 1991). The impetus for using these technologies was to supplement traditional face-to-face and telephone communications between students and faculty which are sometimes inconvenient or impractical due to distance and time constraints. Two experimental school sites (with e-mail and fax capabilities) and one control site were established.

5.2 Enhanced Outside Program Communication

Preservice teachers at Iowa State University embarked on virtual field experiences where they communicated with eighth grade students via e-mail and two-way video connections. These technologies were selected to find a cost-effective way of providing preservice teachers with opportunities to interact with and observe eighth grade students and to assess the students' reading, writing, and verbal communication skills.

A study at the University of North Carolina at Charlotte (UNC) employed a unique strategy to use e-mail to establish communications with practitioners outside of their program (Nason, 1996). These UNC interns were graduating science majors preparing to begin their student teaching. Each student was asked to subscribe to a listserv outside of their program which focused on the area of science they planned to teach. They asked members of the list for practicing scientists to volunteer to write to them using regular e-mail to help with a class assignment. The results of these Internet-based interviews were discussed on the class's own listserv and later compiled into a database for other members of the program.

A program conducted by the University of Wyoming used videotape and live video observations of K-12 classrooms around the state with two-way video follow-up discussions with the classroom teachers (Rezabek et al., 1996).

A study carried out at the University of Massachusetts at Lowell, compares direct field observations with those facilitated by two-way video connections with elementary and secondary schools in the state (McDevitt, 1996). This was a graduate program leading to a master's degree and teacher certification.

5.3 CMC Integrated into Coursework

A researcher at Rowan College examined the use of an e-mail-based discussion list in the author's science methods course (Thirunarayanan, 1996). The students in this program used a discussion list primarily to communicate with one another to complete one of several optional assignments. Through the use of a survey, Thirunarayanan found that the students felt participation on the list enabled them to share experiences and ideas with their classmates, provided them with an opportunity to

learn to use computers and e-mail, and that the experience was interesting and fun. On the other hand, many students complained of a lack of access to computers (especially from home), limited time to participate on the list, and unfamiliarity with the computer system.

5.4 Critical Thinking/Critical Reflection

A joint program between two American colleges used e-mail and discussion lists in a case-based collaborative project aimed at facilitating critical thinking and constructivist learning (Campbell & Zhao, 1996). The program's goals were to help preservice teachers: 1) refine their beliefs about learning and teaching, 2) experience a collaborative and constructivist learning project, 3) acquire skills with computer networking technology, and, 4) develop a positive attitude toward electronic communications. Students at both institutions were required to write five essays analyzing a classroom case from different perspectives which they posted to the list for discussion. Initial results showed little collaboration between students and the study was modified, based on feedback solicited through a weekly e-mail journal response, to create smaller groups, provide more time to complete assignments, and limit the number of cases the students were to examine from five to three.

Undergraduate teacher certification students at the University of Michigan engaged in a semester-long anonymous computer conference aimed at fostering critical reflection (Harrington, 1992; Harrington and Hathaway, 1994). The conference transcript was analyzed at the end of the term and student communications were coded to determine the reflective nature of their messages. Other data collected included observations, written assignments, informal interviews, and anonymous student evaluations.

5.5 Other Objectives

An Australian teacher certification program (Dow & Geer, 1996) used both regular e-mail and e-mail discussion lists to facilitate "deep learning." The authors selected a listserv format based on previous research which found a degree of depth and diversity of engagement not available in traditional classroom interactions (Riedl, 1989). They were also drawn to the group nature of computer conferencing which may be a critical component behind theory-building and the design and application of online educational activities (Ramsden, 1992). The study hoped to: 1) introduce students to the online environment, 2) enable staff to monitor students' understanding of theoretical components of the subject, 3) encourage deeper engagements with subject content, and, 4) increase dialogue about issues of concern to teachers about using technology

6. Methods Used by the Researchers

No one type of data collection method was dominant in the studies under review as the use of surveys (eight), interviews (eight), and electronic communication archives (12) were roughly similar. This finding was surprising as I began this review with the assumption that, given the automatic archival capacity of electronic communications, most researchers would use this automatic transcript rather than more labor-intensive methods like interviews. While twelve studies did use these archives, roughly three-fourths of the studies combined them with other data collection methods.

Despite the widespread use of message archives, most studies provide the reader with only brief quotations from students' messages while few studies provided extended examples of interactions to illustrate their points. Exceptions include Thomas et al. (1996), Schlagal et al. (1996), and Souviney et al. (1995). The same is true for interview transcripts. Although eight studies used interviews, few provided extended examples of the participants' perceptions of the on-line discussion, relying instead on brief quotations or summaries. Even when interviews were used, it is often unclear if the participants' quotes came from interviews or other instruments (e.g. surveys). Including extended transcript sections would potentially offer the reader greater insight into the participants' experience with the conference.

While research on the use of these technologies varies in both emphasis and approach, most studies seem to assume: a) Computer-mediated communications can be understood by analyzing the on-line transcripts, and, b) the preservice teachers' views on their participation in these mediated communications, if they are considered at all, can be understood by collecting and analyzing responses to written surveys. These assumptions are suspect, and I propose that the use of extended interviews with participating interns could shed light on the "bigger picture" of their engagement with these technologies.

7. Research Findings

Schlagal et al. (1996) discuss the importance of the structure of e-mail communications to facilitate the spontaneous exchange of ideas. While I agree in principle, Thomas et al. (1996) found that students filter the messages they receive by reading only selected messages on certain topics. This indicates that while these technologies may facilitate the spontaneous expression of ideas, the process of exchange may be another, more complex, matter related to individual user's engagement with the conference. Harrington and Hathaway (1994) observed that their students were able to express their opinions on educational dilemmas, but that their assumptions often went unchallenged, or when a challenge was presented, few responses were observed.

The problematic nature of the process of communicating via computer deserves greater attention. The previous studies point to the complexity of engagement with these technologies, and reveal how this complexity can diminish the desired outcomes. An in- depth examination of preservice teachers actual use of and engagement with these technologies could provide a deeper understanding of the limitations of CMC in educational settings by revealing the constraints actual users encounter during the course of the conference.

Nearly all the studies divided the on-line communications into several categories. Despite the variety of settings, media, and project goals, several common categories emerged: Personal communications, information exchange, and academic issues. These categories will be discussed in order below.

7.1 Personal Communications

Most programs whose format allowed personal communications seemed to treat them as byproduct of their telecommunication system, if not a hindrance to their project goals. This attitude is understandable considering the serious pedagogical goals most programs established for

their use of electronic communications (e.g. critical reflection, peer mentoring, and problem solving). However, there may be more to the preservice teachers' use of CMC for personal correspondence than is acknowledged by these researchers. Several studies (e.g. Dow and Geer, 1996) cited increased comfort with technology as a goal for their exploration of CMC in their program. Increased use of CMC for personal correspondence seems to indicate a comfort with, if not increased reliance on, these technologies that meet this goal even if it may not directly facilitate other, more scholarly, objectives. It can also be argued that using the computer to communicate with one's friends increases the odds that student will also look at the program's more business-oriented messages.

What role can the use of CMC for personal correspondence have in increasing the ease with which students participate (e.g. voice their opinion, challenge a peer's assumption, or offer advice) in more serious electronic discussions? Programs that forbid, or attempt to curtail, personal messages may be working at cross-purposes, although additional research into this area is necessary. A more holistic view of end-users' engagement with communication technologies should include a discussion of their total telecommunications use which could have broader implications for academic discussions.

A surprising lack of attention was paid to the so-called "emotional content" of many messages. Although Veen et al. (1995) cited the inclusion of emotions and feelings in their interns' communications as evidence of peer support and mentorship, their claim was unsupported by evidence that exchanges about these issues took place. Considering that many programs seem to be organized into cohort groups, one would expect the emotional support of one's peers to receive more attention in the literature. Peer mentoring and support on academic and pedagogical issues are discussed in some studies, but emotional support remains largely ignored. This issue might benefit from additional investigation and could have implications for other types of computer-mediated interactions.

7.2 Information Exchange

Asynchronous computer-mediated communications are particularly well-suited to present information about such items as room changes, meeting times, job postings, program- related administrative notices. This is especially true for those projects whose students were engaged in their field placements, often many miles apart, making traditional communication methods inconvenient at best, and impossible at worst.

Several studies commented on the disappointing lack of participation by some of their interns. This point cannot be overemphasized, not only for information exchange, but for all uses of computer-mediated technologies. Compared with face-to-face communications, CMC lacks immediate feedback, and the "speaker" has no assurance that their message was received, and if it was, if it was understood.

7.3 Academic Issues

This category is rather broad and reflects the various types of academic issues covered in the preceding studies. Reflection was the most common academic issue addressed in these studies (8 of 18), but it was equaled, and even slightly bettered, by more administrative uses of the networks, i.e. general communications (nine) and the sharing of information (eight).

Mentoring ranked second among academic uses of the networks (mentoring by peers = seven, mentoring by faculty = six) and often came in the form of discussion of topics that resembles those often covered in in-class sessions or office hour discussions. However, other examples of mentoring were related to the interns' field practicum which may not have been possible, in the case of peer mentoring, given geographical differences or, in the case of faculty mentoring, took place more often than would have been possible in person or by telephone.

Thomas et al. (1996) include "filtering information" as one use of e-mail by their preservice teachers. One student remarked that she would not, for instance, read all of her peers' responses to a book (p. 169). This finding is telling as much for its inclusion in this study as for its absence in nearly all of the others. Few studies provided the reader with a detailed look at how the preservice teachers actually used the communication channels created for them. Future research should address this need by presenting a description of several interns' long-term engagement with these technologies.

8. Conclusions

The field appears to be in a period of experimentation that may eventually yield productive methods for implementing and evaluating telecommunications technologies in teacher education. Among the various studies described above, several points emerged that could shape future research in computer-mediated communications (CMC) use in preservice teacher education or, I would argue, CMC in general.

A variety of media were used to facilitate discussions among preservice teachers, their faculty, and other people associated with their program of study. It was sometimes difficult to distinguish which media were being used to facilitate discussion, especially whether the communications were one-to-one (like e-mail) or one-to-many (like listservs). The difference between these two methods, which was addressed above, seems great enough to warrant clearly delineating which is being used in a particular study. Doing so will not only help readers understand the context in which the communications are taking place, but can help us better understand the potential impact of various type of communication contexts on educational discussions.

Of even greater importance is the general lack of justification for the type of media being used. One of the few researchers to explicitly address her use of a particular communication technology to achieve a specific pedagogical end (Harrington). Empirically, different media allow for qualitatively different kinds of interactions, and thus it is reasonable to expect that different educational goals might be better fostered by one media over another. However, the reasons behind choosing the media used in nearly all studies were unstated. If immediacy of feedback were deemed important, simple e-mail might be the best choice, however, if one wanted to provide discussion participants with time to reflect on their responses, an asynchronous approach may be more appropriate. Future program development and evaluation in this area would benefit from including an examination of media choice to develop our understanding of the possible advantages, and disadvantages, or various technological options.

Similarly, few of the previous studies explicitly considered the impact of who was participating in the discussion. It seems reasonable to

assume that some, if not many, electronic discussion participants would react differently to a discussion group made up of only their peers versus a group that included people outside the university like cooperating teachers, school administrators, etc. As the use of qualitative methods become more widespread, perhaps these kinds of contextual issues will receive greater attention. Future research in the area of computer-mediated communications would benefit from examining the possible impact of group membership on the dynamics of electronic discussions and, in particular, on the engagement in the conference of individual participants.

A final observation related to qualitative methodology is the general lack of direct quotes from participants in the previous studies (Thomas being a noteworthy exception). Many studies give the impression that analysis of the conference transcript is sufficient to provide insight into the nature of the electronic discussion used in their certification program. While qualitative research methods are becoming increasingly common in the field, extended comments from participants are still rather rare. I would contend that greater use of open- ended interviews with interns would offer a "behind-the-scenes" look at their use of and engagement with various communication media. Perhaps more importantly, such an approach would provide insight into non-use of computer conferences, a perspective unavailable by transcript analysis alone, and only somewhat available through questionnaires.

A review of this emerging field of study finds little substantial commonality among the various approaches being explored, both in the media used to facilitate communication, and in the theoretical frameworks being employed to understand these communications. A review of the literature reveals a wide range of studies with little or no commonly accepted central core of work, methods, or theories to inform future projects or research. These conclusions support Levin's (1995) observation, noted in the introduction, regarding the state of educational telecommunications in general.

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See Berg (1994) for a complete discussion of electronic discussion groups. Some listservs provide their subscribers with a daily digest, in the form of a single e-mail message, of all messages posted to the list within the past 24 hours.

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教職過程におけるテレコミュニケーション（遠距離通信）導入に関する調査

ダグラス J. スコット

この研究ノートは、教職過程におけるテレコミュニケーション使用に関する文献を評論するもので、研究者によって教職過程がどのように評価され得るかについての分析をも含む。又これは現行の研究に関する様々な考え方を探究し、その結果、この分野をよりよく理解し、新たなテレコミュニケーション研究を活気づけ得る共通要素と、将来の研究の位置付けとなる関連文献とのギャップを見い出すことを目的としている。結局この分析により、将来の研究に指針を与えるべき核的業績、方法論、理論が、現行では殆ど、あるいは全く同意に達していないことがわかる。本論文は、教職過程に焦点を当ててはいるが、いかなる教育的遠隔通信研究の創出、実施、評価においても、広く適用できるものである。

キーワード
コンピューター媒介の意志伝達、教育的遠距離通信、教職過程教育

メディア教育開発センター研究協力者　ミシガン州立大学